

REMARKS

Claims 1-3, 5, 6 and 8-24 are pending. Claims 4 and 7 have been canceled.

35 U.S.C. § 103 Rejections

The following rejections are pending:

- A) The Examiner rejects claims 1-3, 8-12, and 16-24 under 35 U.S.C. § 103(a) as being unpatentable over Suwa et al. (US 6,692,887) in view of Yasunami et al. (US 6,696,219);
- B) The Examiner rejects claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Suwa et al. (US 6,692,887) in view of Yasunami et al. (US 6,696,219) as applied to claims 1 and 10 above, and further in view of Jayaraman et al. (US 6,147,177); and
- C) The Examiner rejects claims 5, 6, 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Suwa et al. (US 6,692,887) in view of Yasunami et al. (US 6,696,219) as applied to claims 1 and 10 above, and further in view of Tsunogae et al. (US 6,486,264).

Applicants respectfully traverse Rejections A-C.

Currently, claims 1, 10 and 24 are independent. Inventive claim 1 is exemplary and recites a radiation sensitive composition having the following features:

- i) The radiation sensitive resin composition is capable of forming a positive resin film,
- ii) The radiation sensitive resin composition comprises
 - (A) An alicyclic olefin resin soluble in an alkali, which is a ring-opening polymer having an acidic group which is obtained by ring-opening polymerization of a polymerizable monomer comprising an alicyclic olefin monomer having an acidic group in a presence of a catalyst comprising ruthenium (which is a catalyst comprising as a main component an organoruthenium compound in which a neutral electron-donating ligand is coordinated), followed by hydrogenating an obtained polymer,
 - (B) An acid-generating agent,
 - (C) A crosslinking agent which is a compound capable of forming a crosslinked structure between molecules of the crosslinking agent by heating, and
 - (D) A solvent.

It is noted that in accordance with the present invention, the radiation sensitive resin composition which exhibits not only the excellent specific permittivity, transparency, dimensional stability under heating, solvent resistance and flatness but also the advantages of excellent development and storage stability can be obtained (page 40, INDUSTRIAL APPLICABILITY of the specification). Such effects are not disclosed in any of Suwa et al, Yasunami et al, Jayaraman et al. and Tsunogae et al. The advantage of the radiation sensitive composition of the present invention is clearly shown by comparing data for Examples 1 to 4 of the presently claimed invention in Table 2 on page 39 with those for Comparative Example 1 in which a resin obtained by hydrolyzing the polymer obtained by the ring-opening polymerization of an alicyclic monomer having no acidic group using a tungsten catalyst followed by hydrogenation and Comparative Example 2 in which a resin was obtained by hydrolyzing the polymer obtained by the ring-opening polymerization of an alicyclic monomer having no acidic group using a ruthenium catalyst followed by hydrogenation.

The Examiner relies on the combination of Suwa et al. and Yasunami et al. in finding each of the independent claims 1, 10 and 24 unpatentable. Applicants respectfully submit that the presently claimed invention is not made obvious by Suwa et al. and Yasunami et al.

Suwa et al. disclose a radiation-sensitive resin composition including (A) a resin containing an alicyclic skeleton in its backbone, and (B) a radiation-sensitive acid-generating agent (Abstract of Suwa et al.).

First of all, Suwa et al. do not teach or suggest using a catalyst comprising ruthenium which comprises as a main component an organoruthenium compound in which a neutral electron-donating ligand is coordinated in the ring-opening polymerization of a polymerizable monomer comprising an alicyclic olefin monomer. However, in the second paragraph on page 3 of the Office Action, the Examiner states:

a catalyst comprising ruthenium, Ru (column 14, lines 19-21 and column 28, lines 16-17) that is coordinated with a complexing agent such as triphenylphosphine (column 11, lines 7-9 and for example chlorohydrocarbonyltriphenylphosphine ruthenium - column 28, lines 16-17).

However, the catalyst taught by Suwa et al. in the cited portion by the Examiner is *not a ring-opening polymerization* catalyst of a polymerizable monomer comprising an alicyclic olefin monomer as is recited in claim 1. On the contrary, the catalyst used by Suwa et al. in the portion cited by the Examiner is a *hydrogenation catalyst* used in a hydrogenation reaction which is conducted on the polymer obtained by a ring-opening (co)polymerization. With respect to the catalyst for the ring-opening polymerization, Suwa et al. disclose as follows:

The ring-opening (co)polymerization in the method (a) can be carried out, for example, using a metathesis catalyst in a suitable solvent.

The metathesis catalyst is comprised of generally a combination of at least one compound selected from the group consisting of W, Mo and Re compounds (hereinafter, referred to as "specific transition metal compound") with at least one compound, selected from the group consisting of the compounds of the metals of Group IA, IIA, IIIA, IVA and IVB in the Deming's periodic table, the compounds having metal-carbon bonding and/or metal-hydrogen bonding (hereinafter referred to as "specified organometallic compound").

It is noted that ruthenium is not listed by Suwa et al. in the above-reproduced description as being one of the ring opening polymerization catalysts.

The Examiner cites three separate portions of Suwa et al. for teaching a ring opening polymerization catalyst, a) column 14, lines 19-21; b) column 28, lines 16-17; and c) column 11, lines 7-9.

In one portion of Suwa et al. cited by the Examiner (column 14, lines 19-21), Suwa et al. teach hydrogenation catalysts not ring opening polymerization catalysts, as required by the present claims.

In the second portion of Suwa et al. cited by the Examiner (column 28, lines 16-17), Suwa et al. also teach the hydrogenation catalyst which is clearly understood from the heading, "(3) Hydrogenation".

In the third portion cited by the Examiner (column 11, lines 7-9), Suwa et al. teach:

The specified transition metal compound may be a compound coordinated with a suitable complexing agent such as triphenyl phosphine ($P(C_6H_5)_3$) and pyridine (NC_5H_5).

The Examiner appears to cite this portion relating to the teachings of the ligand as possibly being a triphenyl phosphine or a pyridine.

Thus, Suwa et al. fail to teach or suggest using a catalyst comprising ruthenium in a ring-opening polymerization reaction. Furthermore, Suwa et al. fail to teach or suggest using a catalyst comprising as a main component an organoruthenium compound in which a neutral electron-donating ligand is coordinated.

With respect to the crosslinking agent, the Examiner admits that Suwa et al. fail to disclose the use of a crosslinking agent within the disclosed positive resin composition (the first full paragraph on page 4 of the Office Action).

In addition, Suwa et al. do not teach or suggest to post-bake by heating to cure the developed pattern as recited in inventive claims 10 and 24.

In the first full paragraph on page 4 of the Office Action, the Examiner states:

Suwa et al. also discloses a method of forming a photoresist pattern wherein the above composition is applied to the substrate to form a film (column 24, line 44), applying radiation to the resin film to form a pattern (column 24, lines 49-50) followed by post-exposure baking (column 24, line 60) and development (column 25, lines 9-10) to obtain a pattern.

However, it is noted that the "post-exposure baking" disclosed by Suwa et al. is quite different from the post-baking defined in present claim 10. As is clearly understood from present claim 10, the post-baking is conducted after the latent pattern is developed. In contrast, the "post-exposure baking" in Suwa et al. is conducted after exposure to the radiation and before development. In fact, Suwa et al. teach that the purpose of post-exposure baking "enables the reactions of (g)-(j)", see column 24, lines 60-61 of Suwa et al. Reactions (g)-(j) are set forth in column 23, lines 52 to 63 of Suwa et al. and are quite different from the post-baking in claim 10 of the present invention.

Suwa et al. fail to teach or suggest post-baking a developed pattern by heating to cure the obtained pattern. This post-baking can help to improve the heat resistance of the resin pattern film (page 29, lines 21-25 of the specification).

Lastly, Applicants note that the Comparative Example 1 of the present specification is a proper comparison for use in evaluating the advantages of the present invention over the

teachings of Suwa et al. Applicants note that Suwa et al. is assigned to the JSR Corporation and so is JP 11-52574. The polymerization process using a tungsten catalyst of JP 11-52574 was reproduced in Comparative Example 1 at page 33 of the present specification. Although the polymerization process of Comparative Example 1 is similar to the polymerization process used in Suwa et al, it is not exactly the same. Nevertheless, these differences are not so important when evaluating the differences between the subject matter of the presently claimed invention and that of Suwa et al. It is more important that there are following common features in both of Comparative Example 1 and Suwa et al.:

1. Use of monomers other than those having an acidic group;
2. Use of tungsten catalyst in the ring-opening polymerization; and
3. The resin containing an alicyclic skeleton in its backbone is obtained by hydrolyzing a polymer after ring-opening polymerization followed by hydrogenation.

Therefore, one skilled in the art would consider that the polymer composition of Comparative Example 1 of the present specification and the polymer composition of Suwa et al. having the common features described above would give similar results with respect to properties relating to development and storage stability as evaluated in the Comparative Example 1 of the present specification. In comparing the data for Inventive Examples 1 to 4 of the presently claimed invention in Table 2 on page 39 with those for Comparative Example 1 (in which a resin obtained by hydrolyzing the polymer obtained by the ring-opening polymerization of an alicyclic monomer having no acidic group using a tungsten catalyst followed by hydrogenation), the Inventive Examples 1 to 4 have unexpectedly superior properties relating to development and storage stability.

Thus, significant patentable distinctions exist between the teachings of Suwa et al. and the present invention. In order to cure the deficiencies, the Examiner cites Yasunami et al. Applicants respectfully submit that Yasunami et al. fail to cure the deficiencies of Suwa et al.

Yasunami et al disclose a positive resist laminate. The following is disclosed in the ABSTRACT of Yasunami et al.:

A positive resist laminate which comprises a substrate, a first resist layer and a second resist layer, wherein the first resist layer is to be a heat-hardening layer and

comprises (a-1) a polymer containing an alicyclic skeleton in the side chain thereof, and the second resist layer comprises: (b) a polymer which contains a silicon atom in the side chain thereof and which is insoluble in water and becomes soluble in an aqueous alkali solution by the action of an acid; and (c) a compound which generates an acid upon irradiation with an actinic ray or radiation. (Emphasis added).

As disclosed at column 2, line 36 *et seq.*, the polymer (a-1) of Yasunami et al. includes a combination of repeating unit of formula (1) and formula (2). It appears that the Examiner is relying on the description formula (1) as corresponding to the inventive alicyclic olefin monomer having an acidic group. However, it is clear from the above-reproduced disclosure and the description of formula (1) of Yasunami et al. that the alicyclic group of Yasunami et al. is not a part of the polymer backbone as would be required by the present invention. The present invention requires that the polymerization occurs by "ring-opening polymerization." The alicyclic skeleton of a ring-opening polymer having an acidic group which is obtained by ring-opening polymerization of a polymerizable monomer comprising an alicyclic olefin monomer having an acidic group as recited in claim 1 of the present invention must be present in the main chain. Without being bound to theory, the following is a possible example of the mechanism (albeit without the acidic functionality).



It is clear that Yasunami et al. do not teach a polymer having an alicyclic skeleton in a main chain.

In addition, Yasunami et al. fail to teach or suggest to post-bake the developed pattern as recited in claims 10 and 24 of the present invention.

At the top of the second paragraph on Page 4 of the Office Action the following is stated:

Yasunami et al discloses a positive resist laminate comprising a heat-crosslinking agent such as a melamine compound (column 12, lines 6-13) and a repeating unit

comprising an alicyclic monomer as shown in polymer examples (P-10), (P-11), (P-12).

However, it should again be noted that each of the polymers having an alicyclic skeleton in the side chain as shown in (P-10), (P-11), (P-12) cannot be obtained by a ring-opening polymerization of an alicyclic monomer as set forth above. Thus, Yasunami et al. fail to teach or suggest the substantial features of the presently claimed invention.

Furthermore, it is noted that there is not any suggestion to combine the invention of Suwa et al with the invention of Yasunami et al. Even if Suwa et al. and Yasunami et al. are combined, it is clear that no one of ordinary skill in the art would arrive at the presently claimed invention.

As such, significant patentable distinctions exist between the invention as described in inventive claims 1-3, 8-12, and 16-24 and the combined teachings of Suwa et al. and Yasunami et al.

With respect to inventive claim 15, claim 15 is rejected over the combination of Suwa et al., Yasunami et al. and Jayaraman et al. Claim 15 depends from independent process claim 10. In the outstanding Office Action, the Examiner admits that Suwa et al. and Yasunami et al. fail to disclose the use of an additional alicyclic monomer having an aromatic group and an aprotic polar group bonded thereto. From the discussions set forth above, it is considered that the rejection of claim 10 over Suwa et al. and Yasunami et al. is not tenable. Therefore, even if the use of the monomer taught by Jayaraman et al. is combined with Suwa et al. in view of Yasunami et al., one of ordinary skill in the art would not arrive at the invention as claimed in present claim 15.

In addition, it is further noted that Jayaraman et al. only teach the use of a crosslinking agent for a negative tone photoresist composition but fail to teach or suggest the use of a crosslinking agent for a positive tone photoresist composition, as presently claimed. Lastly, Jayaraman et al. fail to teach or suggest to post-bake a developed pattern as is recited in claim 10.

As such, significant patentable distinctions exist between claim 15 and the combination of Suwa et al., Yasunami et al. and Jayaraman et al.

With respect to claims 5, 6, 13 and 14, these claims are rejected over the combination of Suwa

et al., Yasunami et al. and Tsunogae et al. Applicants respectfully find that these references do not combine to make claims 5, 6, 13 and 14 obvious.

Applicants disagree with the rejection for the following reasons. Tsunogae et al. disclose a process for producing hydrogenated ring-opening polymerization polymer of cycloolefin. Tsunogae et al. disclose to use a polymerization catalyst comprising an organoruthenium compound in which a neutral electron-donating ligand which is a heterocyclic carbene compound having nitrogen is coordinated. Tsunogae et al. disclose also that a monomer having an acidic substituent can be used as a monomer containing an alicyclic olefin monomer for ring-opening polymerization. However, these monomers are only disclosed as possible examples in the ring-opening polymerization. Tsunogae et al. do not teach or suggest that the polymer obtained by Tsunogae et al.'s process can be advantageously used for a photo resist. One of ordinary skill in the art would find no reason to use the organoruthenium catalyst having a neutral electron-donating ligand which is a heterocyclic carbene compound having nitrogen of Tsunogae et al. in place of the ruthenium catalyst of Suwa et al. Even if the catalyst of Tsunogae et al. is used in the Suwa et al.'s catalyst containing ruthenium, one of ordinary skill in the art cannot arrive at the present invention, because the catalyst containing ruthenium of Suwa et al. is used as a catalyst for hydrogenation step.

Further, there would be no rational reason why one skilled in the art would use Tsunogae et al.'s catalyst in place of the Suwa et al.'s metathesis catalyst which is comprised of generally a combination of at least one compound selected from the group consisting of W, Mo and Re compounds (specific transition metal compound) with at least one compound, selected from the group consisting of the compounds of the metals of Group IA, IIA, IIIA, IVA and IVB in the Deming's periodic table, the compounds having metal-carbon bonding and/or metal-hydrogen bonding (specified organometallic compound), because Suwa et al. fail to teach or suggest that a catalyst containing ruthenium can be used as a catalyst for the ring-opening polymerization and Tsunogae et al. fail to teach or suggest that their catalyst can be advantageously used as a catalyst for obtaining the alicyclic resin soluble in alkali used for a resin composition which is capable of forming a positive pattern resin film.

As such, significant patentable distinctions exist between the inventive claims 5, 13 and 14 and the combined teachings of Suwa et al., Yasunami et al. and Tsunogae et al.

With respect to claim 6 (which depends on claim 1), claim 6 is directed to a radiation sensitive resin composition according to claim 1, wherein the polymerizable monomer further comprises an alicyclic olefin monomer in which a group having an aromatic group and an aprotic polar group are bonded. It is unclear to Applicants why claim 6, which does not contain any feature of claim 5, was rejected for the same reason as the rejection of claim 5. Accordingly, clarification is respectfully requested.

Based on the foregoing, the cited references, taken alone or in combination do not render the presently claimed invention obvious. As such, withdrawal of Rejections A-C is respectfully requested.

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

Conclusion

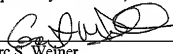
In view of the above remarks, it is believed that claims are allowable.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq., Reg. No. 43,575 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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